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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
YAMNITZKY, MARIE ROSE

ART UNIT	PAPER NUMBER
1774	5

DATE MAILED: 09/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-5

Office Action Summary	Application No.	Applicant(s)	
	09/831,724	WOOD ET AL.	
	Examiner	Art Unit	
	Marie R. Yamnitzky	1774	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 May 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

1. The preliminary amendment filed 05/15/01, which amends claims 4, 6, 7 and 9-11, has been entered. Claims 1-11 are pending.

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because it is too long and because it includes a phrase which can be implied. Correction is required. See MPEP § 608.01(b).

3. Claims 5-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5, with claims 7 and 8 dependent therefrom: Proper antecedent basis is lacking for "the electrode modifying layer adjacent to the anode". Only one of the electrodes is required to having an electrode modifying layer at the electrode/organic layer interface, and that electrode need not be an anode.

Claim 7, with claim 8 dependent therefrom: Proper antecedent basis is lacking for "the cathode" as dependent from claim 5. This rejection could be overcome by amending claim 7 to

depend from claim 6 instead of from claim 5. Proper antecedent basis is also lacking for "the electrode modifying layer adjacent to the cathode". Regardless of whether claim 7 depends from claim 5 or from claim 6, only one of the electrodes is required to have an electrode modifying layer at the electrode/organic layer interface, and that electrode need not be a cathode.

The use of the phrase "further comprises" in claims 9-11 is confusing. It is not clear if the components recited in claims 9-11 are necessarily in addition to the components recited in claim 1. In the case of claim 9, it is not clear if the semi-conducting polymer may also function as the hole transporter or electron transporter required by claim 1. In the case of claims 10 and 11, the distinction between the "charge transporting compounds" which the organic layer further comprises according to these two claims, and the "hole transporter" and "electron transporter" which the organic layer comprises according to claim 1, is not clear.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 4, 6 and 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 9-289081.

See the entire English language translation of JP '081 that is provided with this Office action. In particular, see page 4, last paragraph through page 15, first paragraph of the translation and Figures 1 and 2.

The prior art discloses pyromethene-BF_2 complexes meeting the limitations of a material of present general formula I wherein A – D is the first of the three possibilities set forth in present claim 1 (see PM-1 through PM-8, PM-13 through PM-17 and PM-19 on page 13). The prior art discloses these compounds for use in an organic electroluminescent (EL) device and teaches that they may be provided in the hole transporting layer of the device in combination with one or more organic hole transporting compounds and optionally a binder resin (see page 4, last paragraph, the paragraph bridging pages 7-8 through the paragraph bridging pages 8-9, the paragraph bridging pages 10-11 and the first two full paragraphs on page 11). The prior art device structure also comprises one or two electron transporting layers between the cathode and the hole transporting layer (see the second paragraph on page 10 and the second paragraph on page 14).

Since the compounds themselves have electron transporting and light emitting properties (as recognized by the present claim language which allows the electron transporter and/or the light emitter to comprise the material of general formula I), devices according to the prior art having a pyromethene-BF_2 complex in the hole transporting layer meet the limitations of present claim 1. Although none of the prior art working examples provide a device having a pyromethene-BF_2 complex in the hole transporting layer, one of ordinary skill in the art at the

time of the invention could at once envisage such a device given the prior art's explicit teaching that the pyromethene-BF_2 complex may be in the hole transporting layer.

With respect to present claim 1's recitation "characterised in that the organic layer is a single layer", the examiner notes that this language merely requires a single layer to comprise components that provide the functions of hole transportation, electron transportation and light emission. This language does not exclude the presence of one or more additional organic layers between the electrode structures.

An electron transporting layer in a device according to the prior art having a pyromethene-BF_2 complex in the hole transporting layer meets the limitations of an electrode modifying layer as required by present claim 2.

The device structures depicted in Figures 1 and 2 of the prior art provide an anode as the electrode closest to the substrate as required by present claim 4, and a cathode as the electrode furthest from the substrate as required by present claim 6.

With respect to present claims 9-11, the hole transporting layer of the prior art device comprises one or more hole transporting compounds and may comprise a binder resin as previously noted. A binder resin meets the limitations of a substantially non-conducting polymer as required by present claim 11, and hole transporting compounds meet the limitations of the charge transporting compounds required by present claims 10 and 11. In addition, the pyromethene complex itself is a charge transporting compound. In the first paragraph on page 8, the prior art teaches that the hole transporting layer may comprise polyvinyl carbazole. Polyvinyl carbazole is a semi-conducting polymer as required by present claim 9.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 9-289081 as applied to claims 1, 2, 4, 6 and 9-11 above, and further in view of Zhang et al. (WO 97/32452) and Hung et al. (US 5,677,572).

JP '081 does not explicitly disclose electrode modifying layers at both electrode/ inorganic layer interfaces, does not disclose PEDOT or polyaniline as an electrode modifying layer adjacent to the anode, and does not disclose MgF_2 or LiF as an electrode modifying layer adjacent to the cathode.

Zhang et al. teach that long operating life and other advantages are imparted to organic EL devices by including a layer comprising polyaniline between the anode and the luminescent layer of the devices. For example, see page 13, line 8 through page 15, line 1.

Hung et al. teach that providing a non-conducting layer made of an alkali or alkaline earth fluoride or oxide such as MgF_2 or LiF between an organic layer structure and a conductive layer made of aluminum in an organic EL device provides improved device characteristics such as lower drive voltage. See the whole patent. In particular, see column 4, lines 10-37.

It would have been obvious to one of ordinary skill in the art at the time of the invention to include electrode modifying layers adjacent the anode and the cathode of the devices disclosed

in JP '081 in order to provide the advantages taught by Zhang et al. and Hung et al. One of ordinary skill in the art at the time of the invention would have been motivated to include an electrode modifying layer such as a polyaniline layer adjacent the anode in a device according to JP '081 by Zhang's teachings that a polyaniline layer between the anode and the luminescent layer provides various advantages such as long operating life. One of ordinary skill in the art at the time of the invention would have been motivated to include an electrode modifying layer such as a layer of MgF_2 or LiF adjacent the cathode in a device according to JP '081 by Hung's teachings that a MgF_2 or LiF layer provides improved device characteristics such as lower drive voltage.

8. Claims 1-4, 6 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al. (US 5,281,489) in view of Boyer et al. (US 5,189,029) or Czerney et al. (*Applied Fluorescence Technology*, June 1989, pp. 13-14) or Czerney et al. (DD 265266 A1).

Mori et al. teach organic electroluminescent (EL) devices in which the luminescent layer comprises a mixture of a fluorescent luminescent agent, at least one hole moving and donating agent, and at least one electron moving and donating agent. For example, see column 3, lines 22-47 and c. 4, l. 37 through c. 25, l. 32. The luminescent layer may further comprise a binder polymer as taught at c. 27, l. 15-30. The device may further comprise a layer at the luminescent layer/anode interface, and a layer at the luminescent layer/cathode interface as taught, e.g., at c. 28, l. 63 through c. 29, l. 30.

Mori et al. teach that the fluorescent luminescent agent may be chosen from dyes for a dye laser, but do not explicitly disclose materials of general formula I as required by the present claims.

General formula I as defined in present claim 1 encompasses known laser dyes. Boyer et al. disclose laser dyes of general formula I wherein A – D is the first of the three possibilities set forth in present claim 1. Czerney et al. in *Applied Fluorescence Technology* disclose laser dyes of general formula I wherein A – D is the second of the three possibilities set forth in present claim 1. Czerney et al. in DD 265266 disclose laser dyes of general formula I wherein A – D is the second of the three possibilities set forth in present claim 1 and also disclose laser dyes similar to those of general formula I wherein A – D is the third of the three possibilities set forth in present claim 1.

It would have been obvious to one of ordinary skill in the art at the time of the invention to select a laser dye for use as a fluorescent luminescent agent in Mori's device since Mori teaches the use of laser dyes for this purpose. It would have been within the level of ordinary skill of a worker in the art to select a suitable laser dye from known laser dyes such as those taught by Boyer et al. or Czerney et al. and, as a matter of routine experimentation guided by the teachings of Mori et al, to determine suitable hole transporting and electron transporting components to be combined with a particular known laser dye in order to make an organic EL device according to Mori et al.

With respect to the third possibility for A – D as set forth in present claim 1, in DD 265266, Czerney et al. teach that R^1 and R^2 may combine to form an additional aromatic ring. These prior art compounds are similar to those provided by the third possibility for A – D except that the prior art compounds have an alkyl group (CH_2-R with R = H or alkyl) where the present compounds require a hydrogen. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make compounds similar in structure to those disclosed by the prior art with the expectation that similar compounds would have similar properties and could be used for the same purpose as the prior art compounds. It is the examiner's position that a compound containing a hydrogen atom in place of an alkyl group such as a methyl group is sufficiently similar in structure to the prior art compounds that one of ordinary skill in the art would have reasonably expected compounds similar to those disclosed in DD 265266 having H in place of CH_2-R to have properties of a laser dye.

9. Claims 5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al. (US 5,281,489) in view of Boyer et al. (US 5,189,029) or Czerney et al. (*Applied Fluorescence Technology*, June 1989, pp. 13-14) or Czerney et al. (DD 265266 A1) as applied to claims 1-4, 6 and 9-11 above, and further in view of Zhang et al. (WO 97/32452) and Hung et al. (US 5,677,572).

Mori et al. do not disclose PEDOT or polyaniline as an electrode modifying layer adjacent to the anode, and do not disclose MgF_2 or LiF as an electrode modifying layer adjacent

to the cathode. The references to Boyer et al. and Czerney et al. do not supply these missing features.

Zhang et al. teach that long operating life and other advantages are imparted to organic EL devices by including a layer comprising polyaniline between the anode and the luminescent layer of the devices. For example, see page 13, line 8 through page 15, line 1.

Hung et al. teach that providing a non-conducting layer made of an alkali or alkaline earth fluoride or oxide such as MgF_2 or LiF between an organic layer structure and a conductive layer made of aluminum in an organic EL device provides improved device characteristics such as lower drive voltage. See the whole patent. In particular, see column 4, lines 10-37.

It would have been obvious to one of ordinary skill in the art at the time of the invention to include electrode modifying layers such as a polyaniline layer and a layer of MgF_2 or LiF in Mori's devices in order to provide the advantages taught by Zhang et al. and Hung et al. One of ordinary skill in the art at the time of the invention would have been motivated to include an electrode modifying layer such as a polyaniline layer adjacent the anode in Mori's device by Zhang's teachings that a polyaniline layer between the anode and the luminescent layer provides various advantages such as long operating life. One of ordinary skill in the art at the time of the invention would have been motivated to include an electrode modifying layer such as a layer of MgF_2 or LiF adjacent the cathode in Mori's device by Hung's teachings that a MgF_2 or LiF layer provides improved device characteristics such as lower drive voltage.

10. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner works a flexible schedule but can generally be

reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax numbers for Art Unit 1774 are (703) 872-9311 for official after final faxes and (703) 872-9310 or (703) 305-5408 for all other official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (703) 872-9041.)

MRY
09/06/02

Marie R. Yamnitzky

MARIE YAMNITZKY
PRIMARY EXAMINER

1774